

WHAT IS CLAIMED IS:

1. A method of dissipating heat generated by an electronic component, comprising the step of attaching the electronic component to a heat receiving surface using a thermal adhesive, wherein the thermal adhesive comprises:

a mixture of a curable polymer composition, a solder powder, and a fluxing agent, and wherein the step of attaching comprises heating said mixture to a temperature above the melting point of said solder powder, such that the solder reflows to form interconnecting metal structures dispersed in the polymer matrix, and thereafter curing the polymer matrix.

2. The method of claim 1 wherein said mixture contains 40% to 60% solder powder by volume.

3. The method of claim 1 wherein said mixture further comprises metallic particles having a high melting point.

4. The method of claim 3 wherein said metallic particles have a thermal conductivity of about 400 W/m-K or more.

5. The method of claim 3 wherein the combined volume percentage of metallic particles and solder in said adhesive mixture after it has been cured is about 40 to 60%.

6. The method of claim 3 wherein said metallic particles are copper, silver or a combination thereof.

7. The method of claim 3 wherein said metallic particles have a mean particle size in the range of about 0.01 mm to 0.1 mm.

8. The method of claim 3 wherein at least some of said metallic particles are coated with solder prior to being incorporated into said mixture.

9. The method of claim 1 wherein said polymer matrix is a liquid at room temperature.

10. The method of claim 6 wherein said mixture is formed at less than 80° C.

11. The method of claim 1 wherein said polymer matrix is cured by further heating after the solder has melted and reflowed.

12. The method of claim 1 wherein said electronic component is an IC chip.

13. The method of claim 1 wherein said heat receiving surface is a surface of a heat spreader or heat sink.

14. The method of claim 1 wherein said heat receiving surface is actively cooled.

15. The method of claim 1 wherein said thermal adhesive has a thermal conductivity of about 15 W/mK or more.

16. The method of claim 1 wherein said mixture is dispensed or screen printed onto either said electronic component or onto said heat receiving surface.

17. The method of claim 1 wherein the coefficient of thermal expansion of said electronic component is different than the coefficient of thermal expansion of said heat receiving surface.

18. The method of claim 1 wherein said thermal adhesive has a thickness less than about 0.2 mm.

19. The method of claim 1 wherein said solder has a melting point of about 235°C or less.

20. The method of claim 19 wherein said solder has a thermal conductivity of about 20W/m-K or more.

21. The method of claim 20 is selected from the group consisting of alloys of Sn/Bi, Sn/Pb, Sn/Zn, Sn/Ag, Sn/Cu, Sn/Ag/Cu, and Sn/Ag/Cu/Bi.

22. The method of claim 1 wherein said polymer matrix comprises an epoxy, a silicone or a cyanate ester.

23. A method of attaching a heat producing electronic component to a heat receiving substrate, comprising:

forming an adhesive paste comprising a mixture of solder particles, a fluxing agent and a liquid polymer,

placing said adhesive paste between a mounting surface of said electronic component and an opposing surface of said heat-receiving substrate,

thereafter, heating the assembly to a temperature sufficiently high to cause said solder particles to melt and reflow,

thereafter curing said polymer such that the adhesive paste hardens.

24. The method of claim 23 wherein said mounting surface and said opposing surface are substantially flat and are separated by a distance of about 0.2 mm or less.

25. The method of claim 24 wherein said adhesive paste further comprises particles of a metallic filler material having a high melting point.

26. The method of claim 25 wherein said metallic filler material comprises silver or copper.

27. The method of claim 25 wherein at least some of said metallic particles are precoated with solder prior to being added to said mixture.

28. The method of claim 23 wherein said polymer is thermosetting and has an optimal curing temperature which is different than the melting point of said solder.

29. The method of claim 23 wherein said polymer is relatively low viscosity.

30. The method of claim 25 wherein said mixture comprises more than about 40 to 60% by volume of filler and solder.

31. The method of claim 23 wherein said electronic component and said heat receiving substrate have substantially different coefficients of thermal expansion.

32. A thermal interface adhesive, comprising:

solder particles,

flux material,

metallic filler material having a high melting point, and

a thermally curable polymer composition,

wherein said metallic filler material has a thermal conductivity of about 400 W/m-K or more, said solder particles have a thermal conductivity of about 20W/m-K or more, the combination of said metallic filler material and said solder particles comprise about 40 to 60% by volume of said thermal interface adhesive, and

wherein said thermal interface adhesive has a thermal conductivity of about 15 W/m-K or more after it has been cured.